Assignment 4

Textbook assignment: Chapter 5, "Oblique Triangles," pages 5-1 through 5-23, Chapter 6, "Trigonometric Identities and Equations," pages 6-1 through 6-39, and Chapter 7, "Vectors and Forces," pages 7-1 through 7-27.

Learning Objective:

Apply the Law of Sines and the Law of Cosines in solving oblique triangles.

4-1. A triangle that contains no right angle is an oblique triangle.

1. True
2. False

4-2. Which of the following cases is NOT one of the four standard cases for solving oblique triangles?

1. One side and two angles
2. Two sides and the included angle
3. All three sides
4. All three angles

4-3. The statement, "the lengths of the sides of any triangle are proportional to the sines of their opposite angles," describes the Law of

1. Right Triangles
2. Tangents
3. Sines
4. Cosines

4-4. Which of the following equations is the correct form of the Law of Sines?

1. $x^2 + y^2 = r^2$
2. $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$
3. $\dfrac{b}{\sin A} = \dfrac{c}{\sin B} = \dfrac{a}{\sin C}$
4. $a^2 = b^2 + c^2 - 2bc \cos A$

4-5. Which of the following laws or theorems can best be used in solving an oblique triangle where two angles and a side are known?

1. Law of Tangents
2. Law of Cosines
3. Law of Sines
4. Pythagorean theorem

4-6. Use the values of the functions of special angles to find the length (in inches) of side a in triangle ABC if $A = 45^\circ$, $C = 75^\circ$, and side $b = 8$ inches.

1. $2\sqrt{6}/3$
2. $8\sqrt{2}$
3. $16\sqrt{3}/3$
4. $8\sqrt{6}/3$

4-7. In triangle ABC if $A = 35^\circ$, $C = 60^\circ$, and side $b = 12$, which of the following solutions is correct for triangle ABC?

1. $B = 85^\circ$, $a = 6$, $c = 9$
2. $B = 85^\circ$, $a = 6.9$, $c = 10.4$
3. $B = 78^\circ$, $a = 5$, $c = 11.2$
4. $B = 85^\circ$, $a = 8$, $c = 11.2$

4-8. In triangle ABC, angle A is acute. If you are given angle A, side a, and side c, it is possible to construct two triangles. What must be the relationship between side a and side c? (Note: Since side b is not given, it is the only side that may vary in length.)

1. $a < c$
2. $a \geq c$
3. $a > c$
4. $a = c$

4-9. If angle A is an obtuse angle and side a is equal to or less than side c, how many triangles, if any, may be constructed with these parts?

1. 1
2. 2
3. 3
4. None

4-10. How many solutions, if any, does triangle ABC have if angle $A = 20^\circ$, side $a = 15$ inches, and side $c = 6$ inches?

1. 1
2. 2
3. None
4. An infinite number

4-11. If in triangle ABC, angle $B = 30^\circ$, side $b = 8$ inches, and side $c = 14$ inches, then angle C is equal to

1. 88° 57' only
2. 31° 3' or 88° 57'
3. 61° 3' or 118° 57'
4. 61° 3' only

4-12. Which, if any, of the following solutions is correct concerning triangle ABC when $A = 60^\circ$, $b = 10$, and $a = 5$?

1. $B = 25^\circ$ 40', $C = 94^\circ$ 20', $c = 11.5$
2. $B = 35^\circ$ 16', $C = 84^\circ$ 44', $c = 5.7$
3. $B = 89^\circ$ 33', $C = 30^\circ$ 27', $c = 8.7$
4. No solution is possible

4-13. Which of the following equations is/are the correct form of the Law of Cosines?

1. $a^2 = b^2 + c^2 - 2bc \cos A$
2. $b^2 = a^2 + c^2 - 2ac \cos B$
3. $c^2 = a^2 + b^2 - 2ab \cos C$
4. All of the above

4-14. Which of the following laws or theorems can best be used in solving an oblique triangle where two sides and an angle between them are given or where three sides are given?

1. Law of Sines
2. Law of Tangents
3. Law of Cosines
4. Pythagorean theorem

4-15. If two sides of a triangle are 10 feet and 14 feet in length and the angle between these sides is 60°, what is the length, in feet, of the remaining side?

1. 7.3
2. 9.8
3. 12.5
4. 20.9

4-16. Which, if any, of the following angles is the solution to triangle ABC if sides $a = 8$, $b = 10$, and $c = 12$?

1. $A = 55^\circ$ 46', $B = 41^\circ$ 25', $C = 82^\circ$ 49'
2. $A = 41^\circ$ 25', $B = 55^\circ$ 46', $C = 82^\circ$ 49'
3. $A = 41^\circ$ 25', $B = 34^\circ$ 14', $C = 104^\circ$ 21'
4. No solution is possible

4-17. If the sides of a triangular slab measure 2 yards by 4 yards by 5 yards, what are the sizes of the angles opposite these sides?

1. 22° 20', 49° 27', 108° 13'
2. 22° 40', 49° 33', 107° 57'
3. 22° 20', 71° 2', 86° 38'
4. 18° 43', 79° 55', 81° 22'

Learning Objective:

Determine the area of an oblique triangle.

4-18. The formula area $= \frac{ab \sin C}{2}$ is used to find the area of a triangle when

1. the base and the altitude are given
2. two sides and the included angle are given
3. two sides and the angle opposite one of them are given
4. three sides are given

4-19. The area of a triangle, where $A = 30^o$, $b = 8$ inches, and $c = 5$ inches, is

1. 40 square inches
2. 20 square inches
3. 17.3 square inches
4. 10 square inches

4-20. The formula area $= \frac{c^2 \sin A \sin B}{2 \sin C}$, derived from the Law of Sines, is used to find the area of a triangle when

1. the base and the altitude are known
2. two sides and an angle are known
3. two angles and a side are known
4. three sides are known

In answering items 4-21 through 4-23, select from column B the appropriate formula for finding the area of a triangle PQR having the parts listed in column A.

A. PARTS	B. FORMULAS
4-21. p, q, R	1. area $= \frac{p^2 \sin Q \sin R}{2 \sin P}$
4-22. P, R, p	2. area $= \frac{pq \sin R}{2}$
4-23. q, Q, R	3. area $= \frac{q^2 \sin P \sin R}{2 \sin Q}$
	4. area $= \frac{qr \sin P}{2}$

4-24. The area of a triangle, where $A = 35^o$, $B = 50^o$, and $b = 8$ inches, is

1. 3.0 square inches
2. 14.1 square inches
3. 23.9 square inches
4. 42.6 square inches

Learning Objective:

Apply trigonometric identities and functions to problem solving.

4-25. An equivalent expression for $\sec x \csc x \cot x$ is

1. $\sin^2 x$
2. $\cos^2 x$
3. $\sec^2 x$
4. $\csc^2 x$

4-26. An equivalent expression for $\frac{\csc \theta}{\cot \theta + \tan \theta}$ is

1. $\sin \theta$
2. $\cos \theta$
3. $\csc \theta$
4. $\sec \theta$

4-27. The expression $(1 - \sin^2 x)(1 + \tan^2 x)$ is equivalent to

1. 1
2. $\sin^2 x$
3. $\tan^2 x$
4. 0

4-28. The expression $\sec(-\theta) - \tan(-\theta)\sin(-\theta)$ is equivalent to

1. $\cos \theta$
2. $-\cos \theta$
3. $\frac{-1 - \sin^2 \theta}{\cos \theta}$
4. $\frac{1 + \sin^2 \theta}{\cos \theta}$

4-29. Which of the following equations is an identity?

1. $\cos x\ (\sec x - \cos x) = \sin x$

2. $\cos x\ (\sec x - \cos x) = 1 - \cos x$

3. $\cos x\ (\sec x - \cos x) = \cot x - \cos^2 x$

4. $\cos x\ (\sec x - \cos x) = \sin^2 x$

4-30. The value of $\sec (135^\circ)$ is

1. $\sqrt{2}$

2. $-\sqrt{2}$

3. $\sqrt{2}/2$

4. $-\sqrt{2}/2$

4-31. A simplified expression for $\tan (180^\circ - \beta)$ is

1. $\tan \beta$

2. $\dfrac{1 - \tan \beta}{1 + \tan \beta}$

3. $-\tan \beta$

4. $\dfrac{1 + \tan \beta}{1 - \tan \beta}$

4-32. If $\cos \alpha = 2/5$ and $\sin \beta = 1$, where α is in quadrant IV and β is on the positive Y axis, then $\csc (\alpha + \beta)$ is equal to

1. 2/5
2. -2/5
3. 5/2
4. -5/2

4-33. If $\theta = 150^\circ$, then $\sin 2\theta$ is equal to

1. $-\sqrt{3}/2$
2. $\sqrt{3}/4$
3. $-1/2$
4. $\sqrt{3}/2$

4-34. If $\cos \theta = -1/3$ and θ is in the third quadrant, then $\cos 2\theta$ is equal to

1. 7/9
2. -7/9
3. -1/3
4. -8/9

● The signs that precede the radicals in the half-angle formulas must be selected according to the quadrant in which $\theta/2$ lies. For example,

if $0^\circ \leq \theta \leq 90^\circ$, then $0^\circ \leq \theta/2 \leq 45^\circ$

if $90^\circ \leq \theta \leq 180^\circ$, then $45^\circ \leq \theta/2 \leq 90^\circ$

if $180^\circ \leq \theta \leq 270^\circ$, then $90^\circ \leq \theta/2 \leq 135^\circ$

if $270^\circ \leq \theta \leq 360^\circ$, then $135^\circ \leq \theta/2 \leq 180^\circ$

if $360^\circ \leq \theta \leq 450^\circ$, then $180^\circ \leq \theta/2 \leq 225^\circ$

and so on for all angles.

4-35. What is the value of $\tan \frac{\theta}{2}$, if $\theta = \frac{5\pi}{3}$?

1. $1/3$
2. $-\sqrt{3}$
3. $\sqrt{3}/3$
4. $-\sqrt{3}/3$

4-36. What is the value of $\sin \frac{\theta}{2}$, when $\cot \theta = \frac{5}{12}$, $\csc \theta$ is negative, and $0^\circ < \theta < 360^\circ$?

1. $9/13$
2. $-2\sqrt{13}/13$
3. $-3\sqrt{13}/13$
4. $3\sqrt{13}/13$

4-37. Which of the following equations is NOT a notation for the inverse of the tangent function $y = \tan x$?

1. $x = \tan y$
2. $y = 1/\tan x$
3. $y = \arctan x$
4. $y = \tan^{-1} x$

4-38. The inverse of a particular trigonometric function has many values; but if we restrict the range of the inverse relationship, the value of the trigonometric function is called the

1. principal value
2. limiting value
3. primary value
4. positive value

4-39. The value of Arcsin $\sqrt{3}/2$ in degrees is

1. 30°

2. 45°

3. 60°

4. 75°

4-40. The value of $Cot^{-1}(4.76595)$ in degrees is

1. 11°

2. 78° 9'

3. 11° 51'

4. 168° 9'

4-41. The equation

$$\sin\left[\text{Arccos}\left(-\frac{\sqrt{3}}{2}\right) + \text{Arctan}\left(\frac{3}{4}\right)\right]$$

is equivalent to

1. $\frac{3 - 4\sqrt{3}}{10}$

2. $\frac{2 - 3\sqrt{3}}{10}$

3. $\frac{4 + 3\sqrt{3}}{10}$

4. $\frac{4 - 3\sqrt{3}}{10}$

4-42. A trigonometric equation is an equality that is true for

1. all values of the variable
2. some values but not necessarily for all values of the variable
3. all positive values of the variable
4. all negative values of the variable

4-43. If $\sqrt{3}\cot\theta - 1 = 0$ for $0^\circ \leq \theta < 360^\circ$, then θ =

1. 60° and 240°

2. 30° and 210°

3. 120° and 300°

4. 150° and 330°

Learning Objective:

Apply properties of vectors, forces, and equilibrium to problem solving.

4-44. A vector quantity is one that has

1. magnitude only
2. direction only
3. both magnitude and direction
4. neither magnitude nor direction

4-45. If two vectors are equal, then they are of the same length, are parallel, and point in opposite directions.

1. True
2. False

4-46. The resultant vector, $\vec{R}$, of the vectors $\vec{A}$, $\vec{B}$, and $\vec{C}$ can be represented by which of the following equations?

1. $\vec{R} = \vec{A} + \vec{B} + \vec{C}$

2. $\vec{R} = \vec{B} + \vec{C} + \vec{A}$

3. $\vec{R} = \vec{C} + \vec{A} + \vec{B}$

4. All of the above

4-47. What are the magnitudes of the horizontal and vertical components of a vector having a magnitude of 130 miles, which makes an angle of 68° with the horizontal component vector?

1. 2,401 miles and 14,641 miles
2. 49 miles and 121 miles
3. 18 miles and 112 miles
4. 7 miles and 11 miles

4-48. An automobile travels due east on a level road for 60 km. It then turns due north at an intersection and travels 80 km before stopping. What is the resultant displacement of the car?

1. $2\sqrt{35}$ km
2. 140 km
3. 100 km
4. 10,000 km

4-49. A person walks 3 km north, 4 km west, 5 km south, and 6 km east. What is the magnitude and direction of the resultant vector?

1. $2\sqrt{2}$ km, 45° south of east
2. $2\sqrt{2}$ km, 45° north of east
3. 2 km, 45° south of east
4. 8 km, 45° north of west

4-50. A force of 10 newtons at 50° and another force of 15 newtons at 130° act on the same point. What is the magnitude and direction of the resultant force?

1. 4 newtons, 9° 28'
2. 19.5 newtons, 80° 32'
3. 19.5 newtons, 99° 28'
4. 27.2 newtons, 99° 28'

4-51. A man pushes with 140 newtons of force on the handle of a lawnmower. The angle between the handle and the ground is 55°. What are the magnitudes of the horizontal and vertical components of this force?

1. 9.0 newtons and 10.7 newtons
2. 80.3 newtons and 114.7 newtons
3. 98.0 newtons and 199.9 newtons
4. 170.9 newtons and 244.1 newtons

4-52. What two conditions are required for a body at rest to be in equilibrium?

1. The body must have translatory motion and rotary motion
2. The body must have neither translatory motion nor rotary motion
3. The body must have translatory motion but no rotary motion
4. The body must have rotary motion but no translatory motion

4-53. Three people push on a box. One pushes east with a force of 20 pounds, another pushes northeast with a force of 30 pounds, while the third pushes south with a force of 35 pounds. What would be the magnitude and direction of another person applying an equilibriant force?

1. 69.7 pounds, 53° 45' north of east
2. 69.7 pounds, 53° 45' south of west
3. 43.4 pounds, 18° 31' north of west
4. 43.4 pounds, 18° 31' south of east

4-54. To have no translatory motion, what must be TRUE, in all cases, for the sum of the magnitudes of the horizontal force components, F_x, and the sum of the magnitudes of the vertical force components, F_y?

1. $F_x = 0$ only
2. $F_y = 0$ only
3. $F_x = 0$ and $F_y = 0$
4. $F_x = F_y$

4-55. A 170-pound man sits at the center of a hammock that is tied between two trees 14 feet apart. The hammock sags 2 feet at the center. What is the tension in the ropes at each end of the hammock?

1. 327.4 pounds
2. 309.3 pounds
3. 176.8 pounds
4. 88.4 pounds

4-56. The torque will be considered negative if a force tends to produce a counterclockwise rotation about an axis.

1. True
2. False

4-57. A person trying to move a boulder pushes straight downward with a force of 700 newtons on one end of a crowbar that is 2 meters long. If the crowbar makes an angle of 35° with the horizontal, what is the torque produced by this force? (Hint: A sketch might be helpful.)

1. 200.8 newton·meters
2. 286.7 newton·meters
3. 803.0 newton·meters
4. 1,146.8 newton·meters

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